

# PATENT ABSTRACTS OF JAPAN

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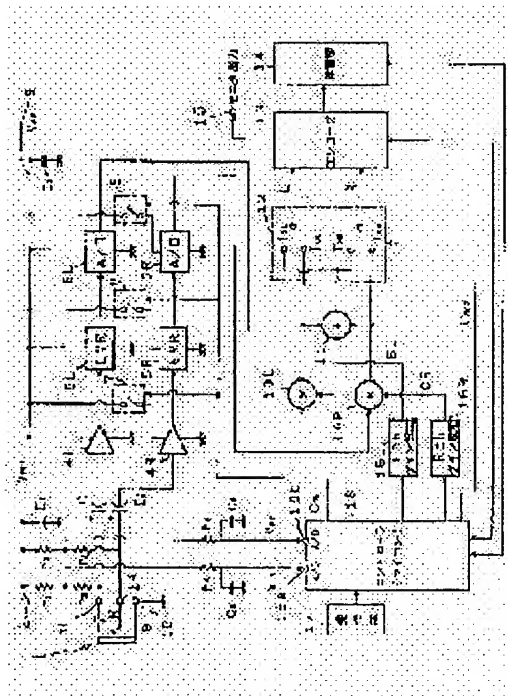
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## (54) RECORDER

### (57)Abstract:

**PURPOSE:** To realize the recorder having good usability by enabling discriminating whether a connected plug is of a monaural type or a stereo type without accompanying the increasing of the scale of a jack part and setting a recording mode according to the discriminated result.

**CONSTITUTION:** A terminal voltage detecting means (r1 to r6, 18a, 18b) capable of detecting an L channel terminal voltage VLT and an R terminal voltage VRT when a microphone plug is connected to a connection jack 1 is provided in this device. A control means 18 discriminates whether the microphone connected to the connection jack means is a stereo microphone or a monaural microphone by the detection result of the terminal voltage detecting means. Then, the control means sets the operating mode of a recording means to either a stereo recording mode or a monaural recording mode based on the discriminated result.



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CLAIMS

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[Claim(s)]

[Claim 1] A connection jack means by which the L channel terminal, the R channel terminal, and the grand terminal are prepared that it should correspond to a stereo microphone plug and a monophonic microphone plug. A terminal voltage detection means by which L channel terminal voltage and R channel terminal voltage can be detected when a microphone plug is connected to said connection jack means. While encoding processing as a stereo sound signal can be performed at the time of a stereophonic recording mode of operation and it can record stereo voice data on a record medium about the sound signal inputted from said connection jack means. By the detection result of the record means which can perform encoding processing as a monophonic sound signal, and can record monophonic voice data on a record medium, and said terminal voltage detection means at the time of a monophonic sound recording mode of operation. It distinguishes whether the microphone connected to said connection jack means is a stereo microphone, or it is a monophonic microphone. Sound recording equipment characterized by having the control means which can set the mode of operation of said record means to any of a stereophonic recording mode of operation or a monophonic sound recording mode of operation based on this distinction result, and being constituted.

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## DETAILED DESCRIPTION

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### [Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the sound recording equipment with which record of monophonic voice data was also enabled while being able to record for example, stereo voice data on a record medium.

[0002]

[Description of the Prior Art] The thing which records music etc. using magnetic tapes, such as a DAT (digital audio tape) recorder, as sound recording equipment, the thing using the magneto-optic disk known as a mini disc recorder, etc. are put in practical use. Quality-ization of loud sound is realized because especially these record a sound signal as digital data.

[0003] Moreover, generally as a sound signal in a general music application etc., a two-channel stereo system and a monophonic method are used in many cases. And when encoding the voice data of a stereo system as record data to a record medium in digital data record, the format is set to constitute the data stream which put L channel data and R channel data in order in time sharing in many cases.

[0004] By the way, since the background developed according to the request of quality[ of loud sound ]-izing from the first existed, most is premised on the sound recording of L and R stereo voice for the sound recording equipment of a digital method. However, although the quality of loud sound like \*\* does not wish by the case where it uses for the sound recording of recent years, for example, a meeting, an interview, etc., the request of wanting to perform long duration sound recording has arisen, and, for this reason, the thing which enabled it to perform monophonic sound recording also by the digital sound recording method is developed. To monophonic sound recording, that what is necessary is just to carry out as [ process / only the sound signal inputted as L channels / as a signal for sound recording ], since the amount of data is set to one half of stereophonic recording, the twice as many time amount which can be recorded as this is acquired with the same record medium. For example, in the case of a mini disc recorder, to monophonic sound recording, the sound recording for 148 minutes is attained for 74 minutes using the mini disc of sound recording.

[0005]

[Problem(s) to be Solved by the Invention] By the way, a stereo microphone and a monophonic microphone exist as a microphone which collects the voice to record. And though natural, a monophonic microphone will be connected and a monophonic sound signal will be inputted into sound recording equipment to connect a stereo microphone, and input a stereo sound signal into sound recording equipment to record in stereo mode, and record in monophonic mode.

[0006] However, a stereo microphone may be connected, when sound recording equipment is in stereo mode, it connects a monophonic microphone depending on the case and sound recording equipment is in monophonic mode conversely, since a change-over in stereo mode / monophonic mode is what is set up when a user performs actuation predetermined by the sound recording equipment side.

[0007] Since only the sound signal of only L channels is inputted when monophonic mode connects a monophonic microphone, even if especially long duration record being one of the big purposes and

sound recording equipment are in stereo mode as mentioned above, If a monophonic microphone is connected when situations, such as an impossible thing, are considered, and sound recording equipment is in stereo mode, stereophonic recording big [ in spite of being able to perform only one channel sound recording, it will be said that long duration sound recording cannot be performed, and ] -- it becomes inconvenient and leads to aggravation of usability. Then, when the user has connected the monophonic microphone, it will be desirable to make it sound recording equipment also serve as sound recording mode automatically.

[0008] Moreover, in order to realize this, it is necessary for the plug of the connected microphone to distinguish a stereo microphone or a monophonic microphone. As for the plug 30 of a stereo microphone, the indicator lamp terminal 31, the R terminal 32, and the grand terminal 33 are formed from the tip side like drawing 4 (a). On the other hand, like drawing 4 (b), a tip side is an indicator lamp terminal (signal terminal) 41, and let the other part be the grand terminal 42 for the plug 40 of a monophonic microphone.

[0009] In order to distinguish such a stereo microphone plug 30 and the monophonic microphone plug 40, it is possible to constitute the jack section of sound recording equipment like drawing 5. When an indicator lamp terminal 51, the R terminal 52, and the <sup>ground</sup> grand terminal 53 are formed at least as the jack section 50 for stereo correspondence and the stereo microphone plug 30 is connected, a L channel sound signal and a R channel sound signal will be inputted from an indicator lamp terminal 51 and the R terminal 52, respectively. Moreover, when the monophonic microphone plug 40 is connected, a monophonic sound signal will be inputted from an indicator lamp terminal 51.

[0010] Here, if the contact forms the detection terminal 54 connected to the R terminal 52, the potential of this detection terminal 54 will serve as a <sup>ground</sup> grand level only when the monophonic microphone plug 40 is connected. It becomes possible for the microphone plug connected by this to perform distinction of a monophonic type or a stereotype. However, by forming such a detection terminal 54, if the jack section 50 was at the large mold, it did not obtain a colander, but when sound recording equipment was a small portable device, it had the problem that it could not be said as a suitable thing.

[0011]

[Means for Solving the Problem] This invention was not made in view of such a trouble, is setting up sound recording mode according to the distinction result, and aims at realizing the good sound recording equipment of usability while the plug connected without being accompanied by enlargement of a jack part enables it to distinguish a monophonic type or a stereotype.

[0012] For this reason, when a microphone plug is connected to a connection jack means, a terminal voltage detection means by which L channel terminal voltage and R channel terminal voltage are detectable is established, and a control means distinguishes whether the microphone connected to the connection jack means by the detection result of this terminal voltage detection means is a stereo microphone, or it is a monophonic microphone. And based on the distinction result, the mode of operation of a record means is set to any of a stereophonic recording mode of operation or a monophonic sound recording mode of operation.

[0013]

[Function] It becomes unnecessary to prepare the terminal for detection special in a connection jack means by distinguishing the type of a microphone plug from L channel terminal voltage and R channel terminal voltage. Moreover, by setting up a mode of operation by the distinction result, convenient actuation for a user will be performed automatically.

[0014]

[Example] Hereafter, the example of the sound recording equipment of this invention is explained. Drawing 1 is the block diagram of the important section of the sound recording equipment of an example. L channel terminal 1L, R channel terminal 1R, and <sup>ground</sup> grand terminal 1G are prepared in the jack section 1, and it considers as stereo input correspondence. Moreover, this jack section 1 is used as a plug-in power terminal, and it enables it to supply the power source of operation over the connected microphone to it from a sound recording equipment side. Namely, plug-in power power-source Rhine 2 to plug-in power power source VPIP Capacitor C3 The resistance r1 for current supply and r2 after

smooth was carried out. It minds, and L channel terminal 1L is supplied, and it is the resistance  $r_3$  for current supply, and  $r_4$ . It minds and R channel terminal 1R is supplied. Thereby, as a microphone connected, the so-called electric capacitor microphone and the so-called dynamic microphone become usable.

[0015] Moreover, resistance  $r_1$  and  $r_2$ . Middle point potential is taken out and they are resistance  $r_5$  and a capacitor C5. A noise component is removed and it is inputted into A/D-conversion input port 18a of the controller 18 formed with a microcomputer. Resistance  $r_3$  and the middle point potential of  $r_4$  are taken out similarly, and they are resistance  $r_6$  and a capacitor C6. A noise component is removed and it is inputted into A/D-conversion input port 18b of a controller 18. For this reason, a controller 18 can distinguish the electrical-potential-difference condition of L channel terminal 1L and R channel terminal 1R.

[0016] The analog sound signal inputted into L channel terminal 1L from the microphone connected to the jack section 1 is the capacitor C1 for DC cut. After minding, being amplified by input amplifier 4L and carrying out level adjustment by electronic volume section 5L, A/D-converter 6L is supplied and it considers as digital data. Moreover, the analog sound signal inputted into R channel terminal 1R from the microphone connected to the jack section 1 is the capacitor C2 for DC cut. After minding, being amplified by input amplifier 4R and carrying out level adjustment by electronic volume section 5R, A/D-converter 6R is supplied and it considers as digital data.

[0017] In the input amplifier 4L and 4R, the electronic volume sections 5L and 5R, and A/D converters 6L and 6R, it is audio power-source Rhine 3 to the smoothing capacitor C4 as supply voltage of operation. It minds and the audio power source VAU is supplied. Switches 7, 8, and 9 are formed between audio power-source Rhine 3, respectively, and it is made by input amplifier 4R which is R channel signal system here, electronic volume section 5R, and A/D-converter 6R as [ intercept / by these switches 7, 8, and 9 being made off / current supply ]. ON/OFF of switches 7, 8, and 9 are performed by the control signal CPW from a controller 18.

[0018] As for the voice data of L channels from A/D-converter 6L, the multiplication of the mix gain GL is carried out by gain multiplier 10L. The output of gain multiplier 10L is supplied to the TSL terminal and mixer circuit 11 of the change-over circuit 12. Based on the control from a controller 18, the value is set up by gain setting section 16L, and the mix gain GL is supplied to gain multiplier 10L. Moreover, as for the voice data of R channels from A/D-converter 6R, the multiplication of the mix gain GR is carried out by gain multiplier 10R. The output of gain multiplier 10R is supplied to the TSR terminal and mixer circuit 11 of the change-over circuit 12. Based on the control from a controller 18, the value is set up by gain setting section 16R, and the mix gain GR is supplied to gain multiplier 10R.

[0019] A controller 18 will set up the value of the mix gain GL and GR outputted from the gain setting sections 16L and 16R according to whether the mode of operation in the distinction result and this sound recording equipment of any of a stereo plug / monophonic plug the microphones connected to the jack section 1 are is set as stereophonic recording mode, or it is set as monophonic sound recording mode.

[0020] In a mixer circuit 11, the output from the gain multipliers 10L and 10R will be added, that is, L and the voice data of R channels will be mixed, and it will output as monophonic voice data. The output of a mixer circuit 11 is supplied to TM1 terminal of the change-over circuit 12, and TM2 terminal.

[0021] The change-over circuit 12 is sound recording mode signal CM/S from a controller 18. Change-over control is carried out. That is, when considering as stereophonic recording mode, they are the sound recording mode signals CM/S. It responds and a TSL terminal and a TSR terminal are chosen. At this time, the output of gain multiplier 10L will be supplied to an encoder 13 as L channel data, and the output of gain multiplier 10R will be supplied to an encoder 13 as R channel data.

[0022] When considering as stereophonic recording mode, in an encoder 13, the L channel data and R channel data which were supplied will be processed as data for sound recording, respectively, necessary encoding processing as stereo data is performed, sound recording data are generated, and the sound recording section 14 is supplied. In the sound recording section 14, a recording head will drive according to the supplied sound recording data, and data logging will be performed to record media, such as a magneto-optic disk. That is, it means that stereo voice data was recorded in this case.

[0023] On the other hand, when considering as monophonic sound recording mode, in the change-over circuit 12, it is sound recording mode signal CM/S. It responds and TM1 terminal and TM2 terminal are chosen. Therefore, the output of a mixer circuit 11 will be supplied to an encoder 13 as L channel data and R channel data.

[0024] When considering as monophonic sound recording mode, in an encoder 13, it will process by using only L channel data as the data for sound recording among the supplied L channel data and R channel data. That is, necessary encoding processing as monophonic data is performed, sound recording data are generated, and the sound recording section 14 is supplied. In the sound recording section 14, a recording head will drive according to the supplied sound recording data, and data logging will be performed to record media, such as a magneto-optic disk. That is, it means that monophonic voice data was recorded in this case.

[0025] In addition, the L channel data and R channel data which are inputted into an encoder 13 in this case turn into the same data, and R channel data can be outputted from the monitor terminal 15 as it is, for example by using R channel data as monitor voice data, although sound recording processing will be carried out. And if it is made to output this from a loudspeaker etc., a user can perform a sound recording monitor.

[0026] The various actuation keys by which actuation of a user is presented with a control unit 17 are prepared. The actuation key which chooses monophonic sound recording mode, the mode, i.e., the stereophonic recording mode, in the case of sound recording, may be made to be prepared as one of them. The actuation information on a control unit 17 is supplied to a controller 18. The controller 18 is constituted by the microcomputer and controls each part based on the program of operation memorized by internal ROM and the actuation information from a control unit 17. That is, actuation of an encoder 13 or the sound recording section 14 is controlled.

[0027] Moreover, a controller 10 performs a monophonic recording / stereo mode-of-operation control with an encoder 13, change-over control of the change-over circuit 12, setting control of the value of the mix gain GL and GR supplied to the gain multipliers 10L and 10R, ON / off control of switches 7, 8, and 9, etc. according to the classification of the connection microphone plug distinguished by the information from A/D input port 18a and 18b. The class distinction of the connected microphone by the controller 18 and the control according to the distinction result and the set-up sound recording mode of operation are explained below.

[0028] On the occasion of sound recording actuation, a user will connect a microphone to the jack section 1, and will perform sound recording actuation. As mentioned above here, the values VLT and VRT according to the terminal voltage of L channel terminal 1L of the jack section 1 and R channel terminal 1R are inputted into a controller 18 from the A/D-conversion ports 18a and 18b.

[0029] A controller 18 performs processing of [ each / of the terminal voltage values VLT and VRT / the predetermined threshold level value VTH ], and he is trying to obtain a distinction result as shown in drawing 2 by the comparison result. namely, the case where the stereo microphone of a gestalt [ like drawing 4 (a) ] whose plug is is connected -- plug-in power supply voltage VPIP from -- as for all, the value of a certain extent becomes what is obtained, and, as for the terminal voltage values VLT and VRT which a partial pressure is carried out and are acquired, the comparison result of  $VLT > VTH$  and  $VRT > VTH$  is obtained. That is, when such a comparison result is obtained, a controller 18 can be distinguished as the connected microphone is a stereo microphone.

[0030] On the other hand, when the monophonic microphone of a gestalt [ like drawing 4 (b) ] whose plug is is connected, a R channel terminal serves as a grand level. That is, about the terminal voltage values VLT and VRT, the comparison result of  $VLT > VTH$  and  $VRT < VTH$  is obtained. When such a comparison result is obtained, a controller 18 can be distinguished as the connected microphone is a monophonic microphone.

[0031] In addition, although the signal level from a microphone is minute and level detection actuation of a high resolution is vitally required to detect the terminal voltage of L channel terminal 1L and R channel terminal 1R, usually In the case of this example, it is the plug-in power supply voltage VPIP. In order to distinguish the electrical-potential-difference condition of the terminal of L channel terminal 1L



and R channel terminal 1R using a resistance partial pressure value, the conversion in the A/D-conversion ports 18a and 18b -- the advantage that it is not necessary to make resolution so high is acquired. Moreover, plug-in power supply voltage VPIP Since it becomes distinction of the terminal voltage condition based on supply, the classification of a plug can be correctly distinguished irrespective of the existence of the voice input from a microphone.

[0032] In a place, when a dynamic microphone with a low output impedance is connected, the terminal voltage values VLT and VRT are considered, also when the comparison result of  $VLT < VTH$  and  $VRT < VTH$  is obtained. In such a case, since a stereo / monophonic distinguishing become impossible, it is possible to make it distinguish from a stereo. however, conversion [ in / this / the A/D-conversion ports 18a and 18b ] -- what is necessary is for distinction to become possible and just to design according to a device according to design situations, such as setting up resolution highly and a setup of the threshold level value VTH

[0033] The following control will be performed when a controller 18 distinguishes whether the microphone connected as mentioned above is a stereo microphone or it is a monophonic microphone. When it is a stereo microphone first, it is sound recording mode signal CM/S to the change-over circuit 12. It supplies and a TSL terminal and a TSR terminal are made to choose. Moreover, it controls to become mix gain  $GL = "1"$  and mix gain  $GR = "1"$  to the gain setting sections 16L and 16R, and the multiplication of the multiplier "1" is made to be carried out to L channel voice data and R channel voice data in the gain multipliers 10L and 10R, respectively. Furthermore, switches 7, 8, and 9 are made into an ON state, and actuation is made to perform R channel signal system. Moreover, a command is sent so that encoding processing of a stereo system may be performed in an encoder 13. Encoding processing will be carried out with an encoder 13 by such control, respectively, and the sound signal of L and R each channel inputted from the jack section 1 to which the stereo microphone was connected will be recorded on a record medium as stereo data in the sound recording section 14.

[0034] Moreover, when it distinguishes that the microphone connected to the jack section 1 is a monophonic microphone, it is sound recording mode signal CM/S to the change-over circuit 12. It supplies and TM1 terminal and TM2 terminal are made to choose. Moreover, it controls to become mix gain  $GL = "1"$  and mix gain  $GR = "0"$  to the gain setting sections 16L and 16R, and carries out as [ carry out / by gain multiplier 10L / to L channel voice data / the multiplication of the multiplier "1" ], and, on the other hand, the multiplication of the multiplier "0" is made to be carried out to R channel voice data in gain multiplier 10R. Furthermore, switches 7, 8, and 9 are made into an OFF state, and, as for R channel signal system, actuation is made not to perform. Moreover, a command is sent so that encoding processing of a monophonic method may be performed in an encoder 13. From a mixer circuit 11, an encoder 13 will be supplied by such control, encoding processing will be carried out, and the sound signal of one channel inputted from the jack section 1 to which the monophonic microphone was connected will be recorded on a record medium as monophonic data in the sound recording section 14.

[0035] Automatic most suitable actuation will be performed by the above control according to the classification of the microphone to which sound recording actuation will be performed as monophonic sound recording mode if a monophonic microphone is connected, sound recording actuation will be performed as stereophonic recording mode if a stereo microphone is connected, and this sound recording equipment was connected. Operability and usability improve greatly by this. Moreover, since it is not necessary to establish independently a terminal device special to classification detection of a microphone, the jack section 1 can also be miniaturized and it will become suitable also as small sound recording equipments, such as portable.

[0036] By the way, although you may enable it to choose whether a sound recording mode of operation is made into stereophonic recording mode by actuation from a control unit 17, or it considers as monophonic sound recording mode, fundamentally, a controller 18 will control according to the sound recording mode set up by actuation in this case. That is, when the control same when it considers as a stereophonic recording mode of operation as the case where connection of an above-mentioned stereo microphone is distinguished is performed and it considers as a monophonic sound recording mode of operation on the other hand, the same control as the case where connection of an above-mentioned



monophonic microphone is distinguished will be performed.

[0037] However, the mode of operation set up from the classification and the control unit 17 of the microphone connected depending on the case may not be in agreement. That is, by actuation by the control unit 17, although it considers as stereophonic recording mode, when a monophonic microphone is connected, although it considers as monophonic sound recording mode, the case where a stereo microphone is connected can be considered by actuation by the control unit 17.

[0038] Although it considers as stereophonic recording mode, when a monophonic microphone is connected, a controller should just control by giving priority to a microphone distinction result. That is, since stereophonic recording is impossible when a monophonic microphone is connected, as mentioned above, according to connection of a monophonic microphone, processing as monophonic sound recording mode is performed. Stereophonic recording with un-proper R channels being a blank is not performed by this, but long duration sound recording actuation to a record medium is realized as monophonic voice. Even if the user forgets mode change-over actuation by this, on a monophonic microphone, monophonic sound recording will be performed and it will become suitable.

[0039] Although it operates as monophonic sound recording on the other hand when a stereo microphone is connected, although it considers as monophonic sound recording mode, it becomes suitable to perform above-mentioned monophonic sound recording control and somewhat different control. Since a R channel sound signal will also be inputted when a stereo microphone is connected, even if it is in monophonic sound recording mode, switches 7, 8, and 9 are set to ON, and perform actuation of R channel signal system.

[0040] Moreover, as monophonic voice data recorded in this case, in order to only employ the signal component of not only L channels but R channels efficiently, it is suitable to make applicable to sound recording the signal which mixed L and the signal of R channels. For this reason, a mixer circuit 11 is formed like drawing 1, and the output of a mixer circuit 11 is made to be supplied to an encoder 13 at the time of monophonic sound recording mode. However, if the signal of both channels is added simply here, the signal level will be sharply changed compared with the case where a monophonic microphone is connected and only a L channel sound signal is made applicable to sound recording. For this reason, in such a case, a controller 18 controls so that the mix gain  $G_L$  and  $G_R$  becomes the value of "0.5", respectively. That is, by the case where a stereo microphone is connected by this and monophonic sound recording is performed, and the case where a monophonic microphone is connected and monophonic sound recording is performed, changing the level of sound recording data sharply is lost, and, in both case, sound recording in suitable level is realized.

[0041] By the way, although the jack section 1 explained as plug-in power correspondence in the above example, even when the jack section which is not plug-in power correspondence is formed, microphone classification detection can be performed similarly. In this case, since it is difficult to detect the terminal voltage of L channel terminal 1L and R channel terminal 1R as it is, it is possible to input the output of the input amplifier 4L and 4R into the A/D-conversion ports 18a and 18b of a controller 18 like drawing 3.

[0042] In addition, although the example has been explained above, the configuration of the sound recording equipment as this invention can consider various modifications further. Moreover, this invention is applicable in various digital sound recording equipments, such as a mini disc recorder and a DAT recorder.

[0043]

[Effect of the Invention] As explained above, since he is trying for the sound recording equipment of this invention to distinguish whether the type of a microphone plug is a stereo, or it is a monophonic recording from L channel terminal voltage and R channel terminal voltage, it becomes unnecessary to prepare the terminal for detection special in a connection jack means, and, for this reason, it can perform [small sound recording equipment] microphone distinction easily. moreover, by setting up a mode of operation by the distinction result of the classification of the monophonic recording/stereo of a microphone, convenient actuation for a user will be performed automatically, and the effectiveness of it being markedly alike and improving has usability and operability.

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JAPANESE [JP,08-293159,A]

CLAIMS DETAILED DESCRIPTION TECHNICAL FIELD PRIOR ART EFFECT OF THE  
INVENTION TECHNICAL PROBLEM MEANS OPERATION EXAMPLE DESCRIPTION OF  
DRAWINGS DRAWINGS

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PRIOR ART

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[0004] By the way, since the background developed according to the request of quality[ of loud sound ]-izing from the first existed, most is premised on the sound recording of L and R stereo voice for the sound recording equipment of a digital method. However, although the quality of loud sound like \*\* does not wish by the case where it uses for the sound recording of recent years, for example, a meeting, an interview, etc., the request of wanting to perform long duration sound recording has arisen, and, for this reason, the thing which enabled it to perform monophonic sound recording also by the digital sound recording method is developed. To monophonic sound recording, that what is necessary is just to carry out as [ process / only the sound signal inputted as L channels / as a signal for sound recording ], since the amount of data is set to one half of stereophonic recording, the twice as many time amount which can be recorded as this is acquired with the same record medium. For example, in the case of a mini disc recorder, to monophonic sound recording, the sound recording for 148 minutes is attained for 74 minutes using the mini disc of sound recording.

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EFFECT OF THE INVENTION

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[Effect of the Invention] As explained above, since he is trying for the sound recording equipment of this invention to distinguish whether the type of a microphone plug is a stereo, or it is a monophonic recording from L channel terminal voltage and R channel terminal voltage, it becomes unnecessary to prepare the terminal for detection special in a connection jack means, and, for this reason, it can perform [ small sound recording equipment ] microphone distinction easily. moreover, by setting up a mode of operation by the distinction result of the classification of the monophonic recording/stereo of a microphone, convenient actuation for a user will be performed automatically, and the effectiveness of it being markedly alike and improving has usability and operability.

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TECHNICAL PROBLEM

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[Problem(s) to be Solved by the Invention] By the way, a stereo microphone and a monophonic microphone exist as a microphone which collects the voice to record. And though natural, a monophonic microphone will be connected and a monophonic sound signal will be inputted into sound recording equipment to connect a stereo microphone, and input a stereo sound signal into sound recording equipment to record in stereo mode, and record in monophonic mode.

[0006] However, a stereo microphone may be connected, when sound recording equipment is in stereo mode, it connects a monophonic microphone depending on the case and sound recording equipment is in monophonic mode conversely, since a change-over in stereo mode / monophonic mode is what is set up when a user performs actuation predetermined by the sound recording equipment side.

[0007] Since only the sound signal of only L channels is inputted when monophonic mode connects a monophonic microphone, even if especially long duration record being one of the big purposes and sound recording equipment are in stereo mode as mentioned above, If a monophonic microphone is connected when situations, such as an impossible thing, are considered, and sound recording equipment is in stereo mode, stereophonic recording big [ in spite of being able to perform only one channel sound recording, it will be said that long duration sound recording cannot be performed, and ] -- it becomes inconvenient and leads to aggravation of usability. Then, when the user has connected the monophonic microphone, it will be desirable to make it sound recording equipment also serve as sound recording mode automatically.

[0008] Moreover, in order to realize this, it is necessary for the plug of the connected microphone to distinguish a stereo microphone or a monophonic microphone. As for the plug 30 of a stereo microphone, the indicator lamp terminal 31, the R terminal 32, and the grand terminal 33 are formed from the tip side like drawing 4 (a). On the other hand, like drawing 4 (b), a tip side is an indicator lamp terminal (signal terminal) 41, and let the other part be the grand terminal 42 for the plug 40 of a monophonic microphone.

[0009] In order to distinguish such a stereo microphone plug 30 and the monophonic microphone plug 40, it is possible to constitute the jack section of sound recording equipment like drawing 5. When an indicator lamp terminal 51, the R terminal 52, and the grand terminal 53 are formed at least as the jack section 50 for stereo correspondence and the stereo microphone plug 30 is connected, a L channel sound signal and a R channel sound signal will be inputted from an indicator lamp terminal 51 and the R terminal 52, respectively. Moreover, when the monophonic microphone plug 40 is connected, a monophonic sound signal will be inputted from an indicator lamp terminal 51.

[0010] Here, if the contact forms the detection terminal 54 connected to the R terminal 52, the potential of this detection terminal 54 will serve as a grand level only when the monophonic microphone plug 40 is connected. It becomes possible for the microphone plug connected by this to perform distinction of a monophonic type or a stereotype. However, by forming such a detection terminal 54, if the jack section 50 was at the large mold, it did not obtain a colander, but when sound recording equipment was a small portable device, it had the problem that it could not be said as a suitable thing.

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[Translation done.]

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MEANS

[Means for Solving the Problem] This invention was not made in view of such a trouble, is setting up sound recording mode according to the distinction result, and aims at realizing the good sound recording equipment of usability while the plug connected without being accompanied by enlargement of a jack part enables it to distinguish a monophonic type or a stereotype.

[0012] For this reason, when a microphone plug is connected to a connection jack means, a terminal voltage detection means by which L channel terminal voltage and R channel terminal voltage are detectable is established, and a control means distinguishes whether the microphone connected to the connection jack means by the detection result of this terminal voltage detection means is a stereo microphone, or it is a monophonic microphone. And based on the distinction result, the mode of operation of a record means is set to any of a stereophonic recording mode of operation or a monophonic sound recording mode of operation.

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OPERATION

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[Function] It becomes unnecessary to prepare the terminal for detection special in a connection jack means by distinguishing the type of a microphone plug from L channel terminal voltage and R channel terminal voltage. Moreover, by setting up a mode of operation by the distinction result, convenient actuation for a user will be performed automatically.

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## EXAMPLE

[Example] Hereafter, the example of the sound recording equipment of this invention is explained. Drawing 1 is the block diagram of the important section of the sound recording equipment of an example. L channel terminal 1L, R channel terminal 1R, and grand terminal 1G are prepared in the jack section 1, and it considers as stereo input correspondence. Moreover, this jack section 1 is used as a plug-in power terminal, and it enables it to supply the power source of operation over the connected microphone to it from a sound recording equipment side. Namely, plug-in power power-source Rhine 2 to plug-in power power source VIP Capacitor C3 The resistance r1 for current supply and r2 after smooth was carried out It minds, and L channel terminal 1L is supplied, and it is the resistance r3 for current supply, and r4. It minds and R channel terminal 1R is supplied. Thereby, as a microphone connected, the so-called electric capacitor microphone and the so-called dynamic microphone become usable.

[0015] Moreover, resistance r1 and r2 Middle point potential is taken out and they are resistance r5 and a capacitor C5. A noise component is removed and it is inputted into A/D-conversion input port 18a of the controller 18 formed with a microcomputer. Resistance r3 and the middle point potential of r4 are taken out similarly, and they are resistance r6 and a capacitor C6. A noise component is removed and it is inputted into A/D-conversion input port 18b of a controller 18. For this reason, a controller 18 can distinguish the electrical-potential-difference condition of L channel terminal 1L and R channel terminal 1R.

[0016] The analog sound signal inputted into L channel terminal 1L from the microphone connected to the jack section 1 is the capacitor C1 for DC cut. After minding, being amplified by input amplifier 4L and carrying out level adjustment by electronic volume section 5L, A/D-converter 6L is supplied and it considers as digital data. Moreover, the analog sound signal inputted into R channel terminal 1R from the microphone connected to the jack section 1 is the capacitor C2 for DC cut. After minding, being amplified by input amplifier 4R and carrying out level adjustment by electronic volume section 5R, A/D-converter 6R is supplied and it considers as digital data.

[0017] In the input amplifier 4L and 4R, the electronic volume sections 5L and 5R, and A/D converters 6L and 6R, it is audio power-source Rhine 3 to the smoothing capacitor C4 as supply voltage of operation. It minds and the audio power source VAU is supplied. Switches 7, 8, and 9 are formed between audio power-source Rhine 3, respectively, and it is made by input amplifier 4R which is R channel signal system here, electronic volume section 5R, and A/D-converter 6R as [ intercept / by these switches 7, 8, and 9 being made off / current supply ]. ON/OFF of switches 7, 8, and 9 are performed by the control signal CPW from a controller 18.

[0018] As for the voice data of L channels from A/D-converter 6L, the multiplication of the mix gain GL is carried out by gain multiplier 10L. The output of gain multiplier 10L is supplied to the TSL terminal and mixer circuit 11 of the change-over circuit 12. Based on the control from a controller 18, the value is set up by gain setting section 16L, and the mix gain GL is supplied to gain multiplier 10L. Moreover, as for the voice data of R channels from A/D-converter 6R, the multiplication of the mix gain GR is carried out by gain multiplier 10R. The output of gain multiplier 10R is supplied to the TSR terminal and mixer

circuit 11 of the change-over circuit 12. Based on the control from a controller 18, the value is set up by gain setting section 16R, and the mix gain GR is supplied to gain multiplier 10R.

[0019] A controller 18 will set up the value of the mix gain GL and GR outputted from the gain setting sections 16L and 16R according to whether the mode of operation in the distinction result and this sound recording equipment of any of a stereo plug / monophonic plug the microphones connected to the jack section 1 are is set as stereophonic recording mode, or it is set as monophonic sound recording mode.

[0020] In a mixer circuit 11, the output from the gain multipliers 10L and 10R will be added, that is, L and the voice data of R channels will be mixed, and it will output as monophonic voice data. The output of a mixer circuit 11 is supplied to TM1 terminal of the change-over circuit 12, and TM2 terminal.

[0021] The change-over circuit 12 is sound recording mode signal CM/S from a controller 18. Change-over control is carried out. That is, when considering as stereophonic recording mode, they are the sound recording mode signals CM/S. It responds and a TSL terminal and a TSR terminal are chosen. At this time, the output of gain multiplier 10L will be supplied to an encoder 13 as L channel data, and the output of gain multiplier 10R will be supplied to an encoder 13 as R channel data.

[0022] When considering as stereophonic recording mode, in an encoder 13, the L channel data and R channel data which were supplied will be processed as data for sound recording, respectively, necessary encoding processing as stereo data is performed, sound recording data are generated, and the sound recording section 14 is supplied. In the sound recording section 14, a recording head will drive according to the supplied sound recording data, and data logging will be performed to record media, such as a magneto-optic disk. That is, it means that stereo voice data was recorded in this case.

[0023] On the other hand, when considering as monophonic sound recording mode, in the change-over circuit 12, it is sound recording mode signal CM/S. It responds and TM1 terminal and TM2 terminal are chosen. Therefore, the output of a mixer circuit 11 will be supplied to an encoder 13 as L channel data and R channel data.

[0024] When considering as monophonic sound recording mode, in an encoder 13, it will process by using only L channel data as the data for sound recording among the supplied L channel data and R channel data. That is, necessary encoding processing as monophonic data is performed, sound recording data are generated, and the sound recording section 14 is supplied. In the sound recording section 14, a recording head will drive according to the supplied sound recording data, and data logging will be performed to record media, such as a magneto-optic disk. That is, it means that monophonic voice data was recorded in this case.

[0025] In addition, the L channel data and R channel data which are inputted into an encoder 13 in this case turn into the same data, and R channel data can be outputted from the monitor terminal 15 as it is, for example by using R channel data as monitor voice data, although sound recording processing will be carried out. And if it is made to output this from a loudspeaker etc., a user can perform a sound recording monitor.

[0026] The various actuation keys by which actuation of a user is presented with a control unit 17 are prepared. The actuation key which chooses monophonic sound recording mode, the mode, i.e., the stereophonic recording mode, in the case of sound recording, may be made to be prepared as one of them. The actuation information on a control unit 17 is supplied to a controller 18. The controller 18 is constituted by the microcomputer and controls each part based on the program of operation memorized by internal ROM and the actuation information from a control unit 17. That is, actuation of an encoder 13 or the sound recording section 14 is controlled.

[0027] Moreover, a controller 10 performs a monophonic recording / stereo mode-of-operation control with an encoder 13, change-over control of the change-over circuit 12, setting control of the value of the mix gain GL and GR supplied to the gain multipliers 10L and 10R, ON / off control of switches 7, 8, and 9, etc. according to the classification of the connection microphone plug distinguished by the information from A/D input port 18a and 18b. The class distinction of the connected microphone by the controller 18 and the control according to the distinction result and the set-up sound recording mode of operation are explained below.

[0028] On the occasion of sound recording actuation, a user will connect a microphone to the jack

section 1, and will perform sound recording actuation. As mentioned above here, the values VLT and VRT according to the terminal voltage of L channel terminal 1L of the jack section 1 and R channel terminal 1R are inputted into a controller 18 from the A/D-conversion ports 18a and 18b.

[0029] A controller 18 performs processing of [ each / of the terminal voltage values VLT and VRT / the predetermined threshold level value VTH ], and he is trying to obtain a distinction result as shown in drawing 2 by the comparison result. namely, the case where the stereo microphone of a gestalt [ like drawing 4 (a) ] whose plug is is connected -- plug-in power supply voltage VPIP from -- as for all, the value of a certain extent becomes what is obtained, and, as for the terminal voltage values VLT and VRT which a partial pressure is carried out and are acquired, the comparison result of  $VLT > VTH$  and  $VRT > VTH$  is obtained. That is, when such a comparison result is obtained, a controller 18 can be distinguished as the connected microphone is a stereo microphone.

[0030] On the other hand, when the monophonic microphone of a gestalt [ like drawing 4 (b) ] whose plug is is connected, a R channel terminal serves as a grand level. That is, about the terminal voltage values VLT and VRT, the comparison result of  $VLT > VTH$  and  $VRT < VTH$  is obtained. When such a comparison result is obtained, a controller 18 can be distinguished as the connected microphone is a monophonic microphone.

[0031] In addition, although the signal level from a microphone is minute and level detection actuation of a high resolution is vitally required to detect the terminal voltage of L channel terminal 1L and R channel terminal 1R, usually In the case of this example, it is the plug-in power supply voltage VPIP. In order to distinguish the electrical-potential-difference condition of the terminal of L channel terminal 1L and R channel terminal 1R using a resistance partial pressure value, the conversion in the A/D-conversion ports 18a and 18b -- the advantage that it is not necessary to make resolution so high is acquired. Moreover, plug-in power supply voltage VPIP Since it becomes distinction of the terminal voltage condition based on supply, the classification of a plug can be correctly distinguished irrespective of the existence of the voice input from a microphone.

[0032] In a place, when a dynamic microphone with a low output impedance is connected, the terminal voltage values VLT and VRT are considered, also when the comparison result of  $VLT < VTH$  and  $VRT < VTH$  is obtained. In such a case, since a stereo / monophonic distinguishing become impossible, it is possible to make it distinguish from a stereo. however, conversion [ in / this / the A/D-conversion ports 18a and 18b ] -- what is necessary is for distinction to become possible and just to design according to a device according to design situations, such as setting up resolution highly and a setup of the threshold level value VTH

[0033] The following control will be performed when a controller 18 distinguishes whether the microphone connected as mentioned above is a stereo microphone or it is a monophonic microphone. When it is a stereo microphone first, it is sound recording mode signal CM/S to the change-over circuit 12. It supplies and a TSL terminal and a TSR terminal are made to choose. Moreover, it controls to become mix gain  $GL = "1"$  and mix gain  $GR = "1"$  to the gain setting sections 16L and 16R, and the multiplication of the multiplier "1" is made to be carried out to L channel voice data and R channel voice data in the gain multipliers 10L and 10R, respectively. Furthermore, switches 7, 8, and 9 are made into an ON state, and actuation is made to perform R channel signal system. Moreover, a command is sent so that encoding processing of a stereo system may be performed in an encoder 13. Encoding processing will be carried out with an encoder 13 by such control, respectively, and the sound signal of L and R each channel inputted from the jack section 1 to which the stereo microphone was connected will be recorded on a record medium as stereo data in the sound recording section 14.

[0034] Moreover, when it distinguishes that the microphone connected to the jack section 1 is a monophonic microphone, it is sound recording mode signal CM/S to the change-over circuit 12. It supplies and TM1 terminal and TM2 terminal are made to choose. Moreover, it controls to become mix gain  $GL = "1"$  and mix gain  $GR = "0"$  to the gain setting sections 16L and 16R, and carries out as [ carry out / by gain multiplier 10L / to L channel voice data / the multiplication of the multiplier "1" ], and, on the other hand, the multiplication of the multiplier "0" is made to be carried out to R channel voice data in gain multiplier 10R. Furthermore, switches 7, 8, and 9 are made into an OFF state, and, as for R

channel signal system, actuation is made not to perform. Moreover, a command is sent so that encoding processing of a monophonic method may be performed in an encoder 13. From a mixer circuit 11, an encoder 13 will be supplied by such control, encoding processing will be carried out, and the sound signal of one channel inputted from the jack section 1 to which the monophonic microphone was connected will be recorded on a record medium as monophonic data in the sound recording section 14.

[0035] Automatic most suitable actuation will be performed by the above control according to the classification of the microphone to which sound recording actuation will be performed as monophonic sound recording mode if a monophonic microphone is connected, sound recording actuation will be performed as stereophonic recording mode if a stereo microphone is connected, and this sound recording equipment was connected. Operability and usability improve greatly by this. Moreover, since it is not necessary to establish independently a terminal device special to classification detection of a microphone, the jack section 1 can also be miniaturized and it will become suitable also as small sound recording equipments, such as portable.

[0036] By the way, although you may enable it to choose whether a sound recording mode of operation is made into stereophonic recording mode by actuation from a control unit 17, or it considers as monophonic sound recording mode, fundamentally, a controller 18 will control according to the sound recording mode set up by actuation in this case. That is, when the control same when it considers as a stereophonic recording mode of operation as the case where connection of an above-mentioned stereo microphone is distinguished is performed and it considers as a monophonic sound recording mode of operation on the other hand, the same control as the case where connection of an above-mentioned monophonic microphone is distinguished will be performed.

[0037] However, the mode of operation set up from the classification and the control unit 17 of the microphone connected depending on the case may not be in agreement. That is, by actuation by the control unit 17, although it considers as stereophonic recording mode, when a monophonic microphone is connected, although it considers as monophonic sound recording mode, the case where a stereo microphone is connected can be considered by actuation by the control unit 17.

[0038] Although it considers as stereophonic recording mode, when a monophonic microphone is connected, a controller should just control by giving priority to a microphone distinction result. That is, since stereophonic recording is impossible when a monophonic microphone is connected, as mentioned above, according to connection of a monophonic microphone, processing as monophonic sound recording mode is performed. Stereophonic recording with un-proper R channels being a blank is not performed by this, but long duration sound recording actuation to a record medium is realized as monophonic voice. Even if the user forgets mode change-over actuation by this, on a monophonic microphone, monophonic sound recording will be performed and it will become suitable.

[0039] Although it operates as monophonic sound recording on the other hand when a stereo microphone is connected, although it considers as monophonic sound recording mode, it becomes suitable to perform above-mentioned monophonic sound recording control and somewhat different control. Since a R channel sound signal will also be inputted when a stereo microphone is connected, even if it is in monophonic sound recording mode, switches 7, 8, and 9 are set to ON, and perform actuation of R channel signal system.

[0040] Moreover, as monophonic voice data recorded in this case, in order to only employ the signal component of not only L channels but R channels efficiently, it is suitable to make applicable to sound recording the signal which mixed L and the signal of R channels. For this reason, a mixer circuit 11 is formed like drawing 1, and the output of a mixer circuit 11 is made to be supplied to an encoder 13 at the time of monophonic sound recording mode. However, if the signal of both channels is added simply here, the signal level will be sharply changed compared with the case where a monophonic microphone is connected and only a L channel sound signal is made applicable to sound recording. For this reason, in such a case, a controller 18 controls so that the mix gain GL and GR becomes the value of "0.5", respectively. That is, by the case where a stereo microphone is connected by this and monophonic sound recording is performed, and the case where a monophonic microphone is connected and monophonic sound recording is performed, changing the level of sound recording data sharply is lost, and, in both

case, sound recording in suitable level is realized.

[0041] By the way, although the jack section 1 explained as plug-in power correspondence in the above example, even when the jack section which is not plug-in power correspondence is formed, microphone classification detection can be performed similarly. In this case, since it is difficult to detect the terminal voltage of L channel terminal 1L and R channel terminal 1R as it is, it is possible to input the output of the input amplifier 4L and 4R into the A/D-conversion ports 18a and 18b of a controller 18 like drawing 3.

[0042] In addition, although the example has been explained above, the configuration of the sound recording equipment as this invention can consider various modifications further. Moreover, this invention is applicable in various digital sound recording equipments, such as a mini disc recorder and a DAT recorder.

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DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] It is the block diagram of the important section of the sound recording equipment of the example of this invention.

[Drawing 2] It is the explanatory view of the microphone classification distinction actuation in the sound recording equipment of an example.

[Drawing 3] It is the explanatory view of the detector part for microphone distinction of other examples.

[Drawing 4] It is the explanatory view of the plug of a stereo microphone and a monophonic microphone.

[Drawing 5] It is the explanatory view of the conventional microphone distinction device.

[Description of Notations]

1 Jack Section

1L L channel terminal

1R R channel terminal

2 Plug-in Power Power-Source Rhine

3 Audio Power-Source Rhine

4L, 4R Input amplifier

5L, 5R Electronic volume

6L, 6R A/D converter

7, 8, 9 Switch

10L, 10R Gain multiplier

11 Mixer Circuit

12 Change-over Circuit

13 Encoder

14 Sound Recording Section

16L, 16R Gain setting section

17 Control Unit

18 Controller

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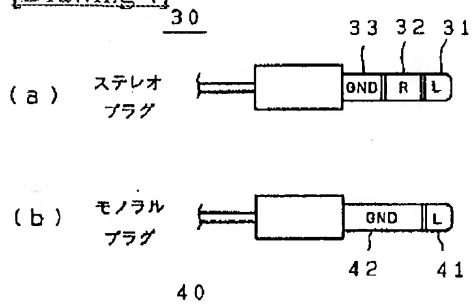
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## DRAWINGS

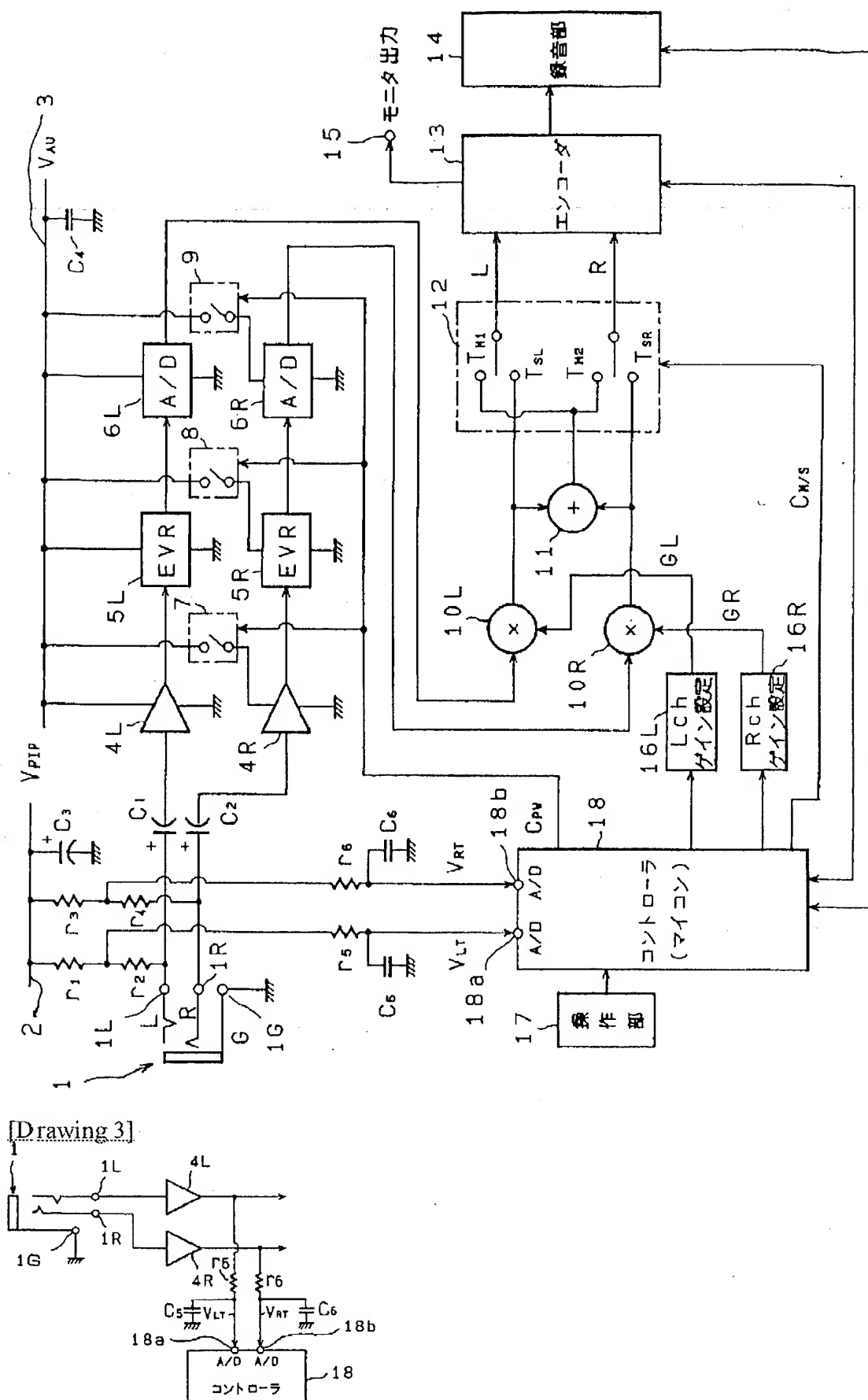
[Drawing 2]

マイクの種類	$V_{LT}$	$V_{RT}$	判別結果
ステレオマイク	$V_{LT} > V_{TH}$	$V_{RT} > V_{TH}$	ステレオ
モノラルマイク	$V_{LT} > V_{TH}$	$V_{RT} < V_{TH}$	モノラル
—	$V_{LT} < V_{TH}$	$V_{RT} < V_{TH}$	(ステレオ)

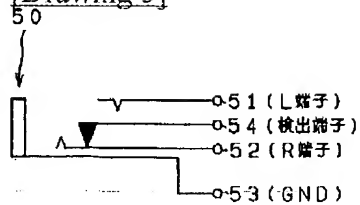
[Drawing 4]



[Drawing 1]



[Drawing 5]



[Translation done.]